

L Number	Hits	Search Text	DB	Time stamp
-	828	aylward.in. "lehnert, hilmar".in. "parker, robert".in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/01 16:42
-	361	"aylward, j".in. "lehnert, hilmar".in. "parker, robert".in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/01 16:43
-	317	"aylward, j. richard".in. "lehnert, hilmar".in. "parker, robert".in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/01 16:43
-	28	("aylward, j. richard".in. "lehnert, hilmar".in. "parker, robert".in.) and \$4speak\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/01 16:47
-	6	5253298.URPN.	USPAT	2003/12/01 16:46
-	121	381/97.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/28 17:15
-	4	5642429.URPN.	USPAT	2003/12/02 09:39
-	5	("3138667" "3947635" "4771466" "4845759" "5233664").PN.	USPAT	2003/12/02 09:50
-	7	5230022.URPN.	USPAT	2003/12/02 09:44
-	4	5912975.URPN.	USPAT	2003/12/02 09:46
-	996	down adj mix\$3 downmix\$3	USPAT	2003/12/02 09:51
-	119	(down adj mix\$3 downmix\$3) and shift\$3 with phas\$2	USPAT	2003/12/02 10:50
-	13	("2964622" "3575660" "4488119" "4755761" "5140198" "5398080" "5410743" "5559457" "5678220" "5826180" "5901349" "5912975" "5922964").PN.	USPAT	2003/12/02 09:52
-	3	("5625696" "5870480" "6381333").PN.	USPAT	2003/12/02 09:57
-	62	("RE25652" "3170991" "3219757" "3236949" "3238304" "3249696" "3892624" "4060696" "4068093" "4118599" "4139728" "4159397" "4192969" "4199658" "4208546" "4209665" "4218585" "4309570" "4356349" "4388494" "4394537" "4567607" "4603429" "4625326" "4661851" "4696035" "4700389" "4706287" "4782530" "4893342" "4908858" "4910778" "4910779" "4975954" "5034983" "5056149" "5095507" "5095798" "5136651" "5173944" "5208493" "5301236" "5319713" "5333200" "5381482" "5384851" "5412732" "5418856" "5420929" "5436975" "5438623" "5440639" "5517570" "5524053" "5533129" "5546465" "5579396" "5581618" "5598478" "5659619" "5862227" "5889867").PN.	USPAT USPAT	2003/12/02 10:15
-	15	4567607.URPN.	USPAT	2003/12/02 10:29

-	62	("RE25652" "3170991" "3219757" "3236949" "3238304" "3249696" "3892624" "4060696" "4068093" "4118599" "4139728" "4159397" "4192969" "4199658" "4208546" "4209665" "4218585" "4309570" "4356349" "4388494" "4394537" "4567607" "4603429" "4625326" "4661851" "4696035" "4700389" "4706287" "4782530" "4893342" "4908858" "4910778" "4910779" "4975954" "5034983" "5056149" "5095507" "5095798" "5136651" "5173944" "5208493" "5301236" "5319713" "5333200" "5381482" "5384851" "5412732" "5418856" "5420929" "5436975" "5438623" "5440639" "5517570" "5524053" "5533129" "5546465" "5579396" "5581618" "5598478" "5659619" "5862227" "5889867").PN.	USPAT	2003/12/02 10:34
-	2556	(low adj frequenc\$3 bass same frequenc\$3) same shift\$3 with phas\$2	USPAT	2003/12/02 10:56
-	9	((low adj frequenc\$3 bass same frequenc\$3) same shift\$3 with phas\$2) and (down adj mix\$3 downmix\$3)	USPAT	2003/12/02 11:05
-	74962	pass adj filter	USPAT	2003/12/02 11:01
-	0	"all pass" adj filter	USPAT	2003/12/02 11:03
-	584	"all-pass" adj filter	USPAT	2003/12/02 11:03
-	669	(all-pass allpass) adj filter	USPAT	2003/12/02 11:04
-	326	(all-pass allpass) adj filter and phase near3 shift\$3	USPAT	2003/12/02 11:04
-	1	((all-pass allpass) adj filter and phase near3 shift\$3) and (down adj mix\$3 downmix\$3)	USPAT	2003/12/02 11:05
-	6	5463424.URPN.	USPAT	2003/12/02 11:09
-	679	381/98.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 11:22
-	8	"all" with pass with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 11:28
-	493	(?ll adj pass ?ll near3 pass) with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 11:28
-	7	5230022.URPN.	USPAT	2003/12/02 11:31
-	4	5912975.URPN.	USPAT	2003/12/02 11:32
-	1	6321076.URPN.	USPAT	2003/12/02 11:39
-	5	("5901349" "5912975" "6029059" "6081697" "6151313").PN.	USPAT	2003/12/02 11:39
-	4	5912975.URPN.	USPAT	2003/12/02 11:42
-	15	("Re29171" "4191852" "4218585" "4817162" "4873722" "4980914" "5119420" "5121433" "5230022" "5339363" "5420929" "5692050" "5742687" "5761313" "5809149").PN.	USPAT	2003/12/02 11:42
-	4	RE29171.URPN.	USPAT	2003/12/02 11:43
-	10	4817162.URPN.	USPAT	2003/12/02 11:45
-	6	5235646.URPN.	USPAT	2003/12/02 11:46
-	284	381/98.ccls. and ((low lower) adj frequenc\$3 bass near4 frequenc\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 12:00
-	121	(381/98.ccls. and ((low lower) adj frequenc\$3 bass near4 frequenc\$3)) and (phase near3 shift\$3 delay)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 12:03

-	57	(381/98.ccls. and ((low lower) adj frequenc\$3 bass near4 frequenc\$3)) and (phase near3 shift\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT USPAT	2003/12/02 12:56 2003/12/02 12:15 2003/12/02 12:15
-	0	5280528.URPN.		
-	17	("3632886" "3708631" "3746792" "3836715" "3864516" "3883692" "3883832" "3885099" "3943287" "3944735" "3959590" "4306200" "4704728" "4706287" "4891839" "4932059" "5046098").PN.		
-	4	("3944941" "4186273" "4891841" "4982435").PN.	USPAT	2003/12/02 12:42
-	2	5325440.URPN.	USPAT	2003/12/02 12:52
-	11	4982435.URPN.	USPAT	2003/12/02 12:54
-	13	("2379714" "2408692" "3127476" "3281533" "3539725" "3805177" "3842702" "4150253" "4182930" "4982435" "5023490" "5175770" "5276764").PN.	USPAT	2003/12/02 12:55
-	887	first adj aduio signal and second adj audio adj signal	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 15:00
-	10	(first adj aduio signal and second adj audio adj signal) and relative with phase near2 shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 12:56
-	24	4356349.URPN.	USPAT	2003/12/02 13:04
-	6	5235646.URPN.	USPAT	2003/12/02 13:30
-	2683	"each"	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 13:32
-	25868	(delay phase adj shift\$3) with channel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 13:35
-	4950	(phase adj shift\$3) with channel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 13:35
-	136	(phase adj shift\$3) with channel and (five six) near3 channels	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 13:35
-	3	relative near3 (phase adj shift\$3) with channel and (five six) near3 channels	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 13:35
-	5	("5642427" "5657391" "5883962" "5912975" "6111958").PN.	USPAT	2003/12/02 13:58
-	0	6507657.URPN.	USPAT	2003/12/02 14:06
-	62	381/97.ccls. and ((low bass) near3 frequenc\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 17:41
-	58	(381/97.ccls. and ((low bass) near3 frequenc\$3)) and phase	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 14:13

-	34	("3541266" "4239939" "4308424" "4394535" "4479235" "4489432" "4496979" "4594610" "4594730" "4625326" "4633495" "4685134" "4706287" "4748669" "4819269" "4836329" "4841572" "4866774" "4972489" "5177329" "5251260" "5319713" "5333201" "5339363" "5459813" "5638452" "5661808" "5771295" "5784468" "5850453" "5870480" "5995631" "6122381" "6243476").PN.	USPAT	2003/12/02 14:18
-	878	relative with phase with channels	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 15:00
-	650	first adj audio adj signal and second adj audio adj signal	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 15:01
-	5	(relative with phase with channels) and (first adj audio adj signal and second adj audio adj signal)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 15:01
-	14	("2093540" "2836662" "2845491" "3236949" "3560656" "3892624" "3970787" "4027101" "4058675" "4069394" "4139728" "4149036" "4159397" "4218585").PN.	USPAT	2003/12/02 15:07
-	30	4218585.URPN.	USPAT	2003/12/02 15:08
-	15	("4107463" "4876719" "5189562" "5319713" "5402500" "5434922" "5701346" "5729227" "5771295" "5841993" "5870365" "5870480" "5896358" "6023490" "6173024").PN.	USPAT	2003/12/02 15:15
-	10	("3632886" "3746792" "3959590" "4589129" "4680796" "4799260" "5172415" "5319713" "5333201" "5642423").PN.	USPAT	2003/12/02 15:18
-	3	5671287.URPN.	USPAT	2003/12/02 16:00
-	3	("3670106" "4653096" "5208860").PN.	USPAT	2003/12/02 16:02
-	15	("3962543" "4188504" "4218585" "5173944" "5181248" "5386082" "5438623" "5452359" "5495534" "5500900" "5526429" "5687239" "5761314" "5796843" "6021205").PN.	USPAT	2003/12/02 17:14
-	710	emphasiz\$3 with (low bass) adj frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 17:20
-	92	(emphasiz\$3 with (low bass) adj frequenc\$3) and (phase with shift\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:05
-	3	("5654909" "5691929" "5926455").PN.	USPAT	2003/12/02 17:25
-	4	("3895321" "4495643" "4701717" "4987378").PN.	USPAT	2003/12/02 17:32
-	6	3895321.URPN.	USPAT	2003/12/02 17:33
-	5	5654909.URPN.	USPAT	2003/12/02 17:33
-	2	("5654909" "5892833").PN.	USPAT	2003/12/02 17:35
-	5	5654909.URPN.	USPAT	2003/12/02 17:36
-	3	("5313494" "5617480" "5654909").PN.	USPAT	2003/12/02 17:36
-	4	("3895321" "4495643" "4701717" "4987378").PN.	USPAT	2003/12/02 17:37
-	20	4495643.URPN.	USPAT	2003/12/02 17:38
-	10	5657391.URPN.	USPAT	2003/12/02 17:46

-	17	("3746792" "4159397" "4188504" "4349698" "5123050" "5173944" "5216718" "5261005" "5404406" "5524053" "5546465" "5579396" "5604809" "5657391" "5680464" "5727067" "5872851").PN.	USPAT	2003/12/02 17:48
-	0	6507657.URPN.	USPAT	2003/12/02 17:56
-	5	("5642427" "5657391" "5883962" "5912975" "6111958").PN.	USPAT	2003/12/02 17:56
-	71	("4239936" "4363007" "4409435" "4442546" "4459851" "4495643" "4517415" "4559642" "4581758" "4589137" "4622692" "4628529" "4653102" "4653606" "4658426" "4696043" "4718096" "4731850" "4741038" "4750207" "4769847" "4802227" "4811404" "4910718" "4910719" "4932063" "4937871" "4956867" "4965834" "5075694" "5086415" "5142585" "5192918" "5208864" "5212764" "5241692" "5313555" "5319736" "5335011" "5353376" "5381473" "5412735" "5416845" "5416847" "5416887" "5432859" "5473701" "5473702" "5485515" "5511128" "5515378" "5524056" "5524057" "5546090" "5581620" "5592181" "5592490" "5615175" "5625697" "5625880" "5627799" "5642353" "5644641" "5657393" "5664021" "5668747" "5673325" "5689572" "5701344" "5715319" "5727073").PN.	USPAT	2003/12/02 17:59
-	6	3895321.URPN.	USPAT	2003/12/02 17:59
-	2	5325440.URPN.	USPAT	2003/12/02 18:04
-	23	381/97.ccls. and 381/98.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:14
-	7	5230022.URPN.	USPAT	2003/12/02 18:09
-	1251	relative same phase same (shift\$3 difference) same channels	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:16
-	92	(relative same phase same (shift\$3 difference) same channels) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:15
-	29	relative same phase same (shift\$3 difference) same channels same (low bass) adj frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:20
-	2557	phase with (shift\$3 difference) with (low bass) adj frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:20
-	686	(phase with (shift\$3 difference) with (low bass) adj frequenc\$3) and (381/\$.ccls. audio sound music acoustic)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/02 18:21
-	29	5083224.URPN.	USPAT	2003/12/02 18:26
-	14	5119420.URPN.	USPAT	2003/12/02 18:32
-	6	5235646.URPN.	USPAT	2003/12/02 18:37
-	15	("3632886" "3708631" "3746792" "3836715" "3864516" "3883692" "3883832" "3885099" "3943287" "3944735" "3959590" "4704728" "4891839" "4932059" "5046098").PN.	USPAT	2003/12/02 18:41
-	4	("5067157" "5119420" "5121433" "5305386").PN.	USPAT	2003/12/04 16:56

-	24	4356349.URPN.	USPAT	2003/12/04 17:25
-	123	381/97.ccls. and 381/97.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 17:41
-	23	381/97.ccls. and 381/98.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 17:49
-	2	4403112.URPN.	USPAT	2003/12/04 17:43
-	2	("3725586" "3984635").PN.	USPAT	2003/12/04 17:44
-	123	381/97.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:07
-	14	4472834.URPN.	USPAT	2003/12/04 18:00
-	7	("3585311" "3665105" "3992582" "4039755" "4061876" "4186643" "4349697").PN.	USPAT	2003/12/04 18:03
-	412	381/61.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:07
-	209	381/61.ccls. and (phase same shift\$3 delay\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:08
-	100	(381/61.ccls. and (phase same shift\$3 delay\$3)) and (bass low) with frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:10
-	22	((381/61.ccls. and (phase same shift\$3 delay\$3)) and (bass low) with frequenc\$3) and (five six "5" "6") with channels	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:28
-	5	("5642427" "5657391" "5883962" "5912975" "6111958").PN.	USPAT	2003/12/04 18:18
-	2718	phase with shift\$3 with equation	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 18:28
-	51	(phase with shift\$3 with equation) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 19:49
-	6	3777076.URPN.	USPAT	2003/12/04 18:32
-	2	3845245.URPN.	USPAT	2003/12/04 18:37
-	3	("3745252" "3777076" "3787622").PN.	USPAT	2003/12/04 18:38
-	5	("3745252" "3718773" "3708631" "3684835" "3632886").PN.	USPAT	2003/12/04 18:42
-	2	("3745252" "3856992").PN.	USPAT	2003/12/04 18:54
-	9	3856992.URPN.	USPAT	2003/12/04 19:00
-	4	4251685.URPN.	USPAT	2003/12/04 19:45
-	2635	phase with shift\$3 and "270" and "0" and "180" and "90"	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 19:51
-	28	(phase with shift\$3 and "270" and "0" and "180" and "90") and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 19:56

-	173467	"90" adj degree	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 19:55
-	317	"90" adj degree and "0" adj degree and "270" adj degree and "180" adj degree and phase same shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:33
-	455	(phase with shift\$3 and "270" and "0" and "180" and "90") and (381/\$.ccls. 7?/?\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:20
-	25	3745254.URPN.	USPAT	2003/12/04 20:00
-	70	("3229038" "3246081" "3249696" "3665105" "3697692" "3725586" "3745254" "3757047" "3761631" "3772479" "3849600" "3885101" "3892624" "3925615" "3943293" "4024344" "4063034" "4069394" "4118599" "4139728" "4192969" "4204092" "4209665" "4218583" "4219696" "4237343" "4303800" "4308423" "4308424" "4309570" "4332979" "4349698" "4355203" "4356349" "4393270" "4394536" "4408095" "4479235" "4489432" "4495637" "4497064" "4503554" "4567607" "4569074" "4589129" "4594610" "4594729" "4594730" "4622691" "4648117" "4696036" "4703502" "4748669" "4856064" "4866774" "4866776" "4888809" "4953213" "5033092" "5046097" "5105462" "5146507" "5208860" "5228085" "5251260" "5255326" "5325435" "5371799" "5533129" "5572591").PN.	USPAT USPAT	2003/12/04 20:22
-	1	5970152.URPN.	USPAT	2003/12/04 20:42
-	8	("5200709" "5257313" "5459790" "5680464" "5748746" "5970152" "6009179" "6122382").PN.	USPAT	2003/12/04 20:44
-	26	("90" adj degree and "0" adj degree and "270" adj degree and "180" adj degree and phase same shift\$3) and (381/\$.ccls. 7?/?\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:34
-	709	("90" and "0" and "270" and "180") same degree and phase same shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:34
-	81	((("90" and "0" and "270" and "180") same degree and phase same shift\$3) and (381/\$.ccls. 7?/?\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:35
-	55	((("90" and "0" and "270" and "180") same degree and phase same shift\$3) and (381/\$.ccls. 7?/?\$.ccls.)) not ((("90" adj degree and "0" adj degree and "270" adj degree and "180" adj degree and phase same shift\$3) and (381/\$.ccls. 7?/?\$.ccls.))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:39
-	2548	frequency adj spacing	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 21:39
-	27	(frequency adj spacing) and (all-pass allpass) with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:22

-	891	(frequency adj spacing) and (pass) with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:20
-	122	((frequency adj spacing) and (pass) with filter) and (381/\$.ccls. 7?/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:21
-	27	(frequency adj spacing) and (all-pass allpass all? adj pass) with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:23
-	0	(all? adj pass) with filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/04 22:23
-	24	4356349.URPN.	USPAT	2003/12/14 21:55
-	59	("Re25652" "3170991" "3219757" "3236949" "3238304" "3249696" "3892624" "4039755" "4068093" "4118599" "4139728" "4159397" "4192969" "4199658" "4208546" "4209665" "4218585" "4309570" "4356349" "4388494" "4394537" "4567607" "4603429" "4625326" "4696035" "4700389" "4706287" "4782530" "4893342" "4908858" "4910778" "4910779" "4975954" "5034983" "5052685" "5056149" "5095507" "5095787" "5136651" "5173944" "5208493" "5301236" "5319713" "5333200" "5381482" "5384851" "5412732" "5418856" "5420929" "5436975" "5440639" "5517570" "5524053" "5533129" "5546465" "5553149" "5579396" "5581618" "5598478").PN.	USPAT USPAT	2003/12/14 22:01
-	0	all adj pass with low adj frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 22:15
-	47	all-pass with low adj frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 22:24
-	133	griesinger.in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 22:24
-	11	"griesinger, david".in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 23:06
-	18	"klayman".in. and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 23:24
-	2	5892830.URPN.	USPAT	2003/12/14 23:10
-	35	("1616639" "1951669" "2113976" "2315248" "2315249" "2461344" "3398810" "3612211" "4045748" "4118600" "4182930" "4481662" "4698842" "4748669" "4790014" "4819269" "4836329" "4841572" "4866774" "5067157" "5177329" "5251260" "5319713" "5333201" "5359665" "5459813" "5638452" "5661808" "5668885" "5771295" "5771296" "5784468" "5850453" "5872851" "5930373").PN.	USPAT USPAT	2003/12/14 23:11

-	14	("2093540" "2836662" "2845491" "3236949" "3560656" "3892624" "3970787" "4027101" "4058675" "4069394" "4139728" "4149036" "4159397" "4218585").PN.	USPAT	2003/12/14 23:11
-	7	5230022.URPN.	USPAT	2003/12/14 23:21
-	24	4356349.URPN.	USPAT	2003/12/14 23:22
-	67	low adj frequency adj enhanc\$5	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 23:24
-	11	(low adj frequency adj enhanc\$5) and low adj pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/14 23:37
-	30	4218585.URPN.	USPAT	2003/12/14 23:28
-	61	("3170991" "3246081" "3249696" "3665105" "3697692" "3725586" "3745254" "3757047" "3761631" "3772479" "3849600" "3885101" "3892624" "3943293" "4024344" "4063034" "4069394" "4118599" "4139728" "4192969" "4218585" "4219696" "4237343" "4239937" "4303800" "4308423" "4308424" "4309570" "4332979" "4349698" "4355203" "4356349" "4393270" "4394536" "4408095" "4479235" "4489432" "4495637" "4497064" "4503554" "4567607" "4569074" "4589129" "4594610" "4594730" "4748669" "4856064" "4866774" "4953213" "5046097" "5105462" "5208860" "5251260" "5255326" "5319713" "5400405" "5533129" "5661808" "5692050" "5850454" "5883962").PN.	USPAT	2003/12/14 23:29
-	19	(creat\$3 generat\$3 establish\$3 making) with low adj frequency adj (channel signal) near6 low adj pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/15 10:26
-	2	4251685.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/15 10:26
-	2	4910779.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/12/15 10:26
-	186	shift\$4 with limited with frequenc\$3 with range	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/28 13:33
-	100	shift\$4 with limited with frequenc\$3 near2 range	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/28 13:33
-	0	(shift\$4 with limited with frequenc\$3 near2 range) and (381/\$.ccls)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/28 13:34
-	0	(shift\$4 with limited with frequenc\$3 near2 range) and (181/\$.ccls)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/28 13:34

-	5	(shift\$4 with limited with frequenc\$3 near2 range) and (381/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT USPAT	2004/06/28 13:34
-	26	4356349.URPN.		2004/06/28 14:11
-	59	("Re25652" "3170991" "3219757" "3236949" "3238304" "3249696" "3892624" "4039755" "4068093" "4118599" "4139728" "4159397" "4192969" "4199658" "4208546" "4209665" "4218585" "4309570" "4356349" "4388494" "4394537" "4567607" "4603429" "4625326" "4696035" "4700389" "4706287" "4782530" "4893342" "4908858" "4910778" "4910779" "4975954" "5034983" "5052685" "5056149" "5095507" "5095787" "5136651" "5173944" "5208493" "5301236" "5319713" "5333200" "5381482" "5384851" "5412732" "5418856" "5420929" "5436975" "5440639" "5517570" "5524053" "5533129" "5546465" "5553149" "5579396" "5581618" "5598478").PN.	USPAT	2004/06/28 14:15
-	70	("3170991" "3229038" "3238304" "3246081" "3725586" "3772479" "3860951" "3883692" "3911220" "3916104" "3925615" "3943293" "3944748" "3989897" "4024344" "4027101" "4030342" "4063034" "4069394" "4085291" "4087629" "4087631" "4097689" "4118599" "4135158" "4139728" "4149031" "4149036" "4152542" "4162457" "4185239" "4188504" "4192969" "4204092" "4208546" "4209665" "4214267" "4218585" "4219696" "4239937" "4239939" "4251688" "4268915" "4303800" "4308423" "4308426" "4309570" "4316058" "4329544" "4334740" "4349698" "4352953" "4355203" "4356349" "4388494" "4393270" "4394536" "4394537" "4446488" "4489432" "4495637" "4503554" "4546389" "4549228" "4551770" "4553176" "4562487" "4567607" "4599611" "4683496").PN.	USPAT	2004/06/28 14:38
-	6	("3539729" "3673342" "3745254" "3753159" "3786193" "3823268").PN.	USPAT	2004/06/28 15:49
-	143	381/10.ccls.\	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT	2004/06/28 16:50
-	14	381/10.ccls. and phase near3 shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT	2004/06/28 16:51
-	4	("3943293" "4039755" "4198543" "4221928").PN.	USPAT	2004/06/28 16:58
-	143	381/10.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT	2004/06/28 17:14
-	63	381/97.ccls. and (low bass) near3 frequenc\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT USPAT	2004/06/28 17:16
-	10	("4356349" "4403112" "4590248" "4623708" "4841572" "5033092" "5172415" "5233665" "5301237" "5339363").PN.	USPAT	2004/06/28 17:22

-	459	downmix\$3 down adj (mix mixes mixing mixer mixes) and (low adj (pass frequenc\$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/29 11:04
-	2	6683962.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 10:44
-	196	griesinger.in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 10:44
-	21	griesinger.in. and (Dave david).in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:09
-	10	("4356349" "4403112" "4590248" "4623708" "4841572" "5033092" "5172415" "5233665" "5301237" "5339363").PN.	USPAT	2004/06/30 10:58
-	26	4356349.URPN.	USPAT	2004/06/30 11:02
-	343	(dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:11
-	213	((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:12
-	1823	downmix\$3 down adj (mix mixes mixing mixer mixes)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:13
-	5	((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:17
-	0	6683962.URPN.	USPAT	2004/06/30 11:15
-	0	6683962.URPN.	USPAT	2004/06/30 11:15
-	0	6683962.URPN.	USPAT	2004/06/30 11:16
-	0	((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:17
-	0	((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:17
-	5	((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:17
-	14173	relative with phase with shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:18

-	14173	relative with phase with shift\$3	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:24
-	834	relative with phase with shift\$3 with (combin\$3 sum sums summing)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:33
-	237388	low adj (frequency pass) bass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:13
-	17	(relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:30
-	11	(relative with phase with shift\$3 with (combin\$3 sum sums summing)) same (low adj (frequency pass) bass) not ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:30
-	3	relative with phase with shift\$3 with (combin\$3 sum sums summing) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 12:00
-	23	("2846504" "3088997" "3863028" "3970787" "4088849" "4119798" "4209665" "4218585" "4251688" "4308424" "4589128" "5033086" "5181248" "5371799" "5386082" "5438623" "5459790" "5546465" "5579396" "5598478" "5638343" "5661812" "5742689").PN.	USPAT	2004/06/30 11:36
-	2603	enhanc\$5 with (low adj frequenc\$3 bass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:37
-	1782	enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 12:01
-	334	(enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:42
-	146	(enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls. and low adj pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 11:42
-	5	("5768394" "6009179" "6067361" "6122381" "6332026").PN.	USPAT	2004/06/30 11:57
-	8	("4154979" "5111508" "5172415" "5251260" "5384855" "5506907" "5546465" "5621489").PN.	USPAT	2004/06/30 11:58
-	4	relative with phase with shift\$3 same (combin\$3 sum sums summing) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 12:01
-	3742305	adder summing summation sum sums summer adding combin\$5	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 12:01

-	3	relative with phase with shift\$3 same (adder summing summation sum sums summer adding combin\$5) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker) not (relative with phase with shift\$3 with (combin\$3 sum sums summing) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:12
-	2092425	first adj low adj pass and second adj low pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:12
-	2250	first adj low adj pass and second adj low adj pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:12
-	1717	first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:13
-	93	first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:14
-	150740	low adj (frequency) bass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:14
-	100	(first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.) AND81	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:14
-	57	(first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.) AND (low adj (frequency) bass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:19
-	90	(two pair) near2 (low adj frequenc\$3 adj \$speaker subwoofer sub adj woofer)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:20
-	96	(two pair dual) near2 (low adj frequenc\$3 adj \$speaker subwoofer sub adj woofer)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 13:21
-	96	(two pair dual) near2 (low adj frequenc\$3 adj \$4speaker subwoofer sub adj woofer)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:41
-	11	("D233763" "1586659" "2093076" "2179840" "2192959" "2390834" "3135830" "3478167" "3657480" "3867996" "3947635").PN.	USPAT	2004/06/30 13:24
-	18	4230905.URPN.	USPAT	2004/06/30 13:25
-	16	("2110358" "3005873" "3125181" "3947635" "3989908" "3991370" "4035589" "4048573" "4163119" "4230905" "4260954" "4327250" "4382157" "4475233" "4481660" "4581589").PN.	USPAT	2004/06/30 13:26
-	3	4905284.URPN.	USPAT	2004/06/30 15:14
-	3	("4118599" "4905284" "4933768").PN.	USPAT	2004/06/30 15:17
-	3	("4118599" "4905284" "4933768").PN.	USPAT	2004/06/30 15:18
-	0	wo-919207.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:41

-	0	wo-919207-\$.did.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:42
-	0	wo-0919207-\$.did.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:42
-	0	wo-0919407-\$.did.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:42
-	0	wo-919407-\$.did.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 15:42
-	2	6240189.URPN.	USPAT	2004/06/30 15:44
-	25	("4802119" "4991217" "5193204" "5206884" "5222081" "5235671" "5374916" "5436900" "5467087" "5491771" "5497373" "5553063" "5553271" "5594560" "5652903" "5761516" "5768613" "5784544" "5832120" "5835375" "6081783" "6108430" "6181796" "6205223" "6240189").PN.	USPAT	2004/06/30 15:53
-	0	gb-394325-\$.did.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:10
-	821	filter with factor with "16"	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:10
-	33	(filter with factor with "16") and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:16
-	1	(filter with factor with "16") and 181/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:17

-	22925	<p>(6683962.pn. griesinger.in. (griesinger.in. and (Dave david).in.) ("4356349" "4403112" "4590248" "4623708" "4841572" "5033092" "5172415" "5233665" "5301237" "5339363").PN.)</p> <p>4356349.URPN. ((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) (downmix\$3 down adj (mix mixes mixing mixer mixes)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) 6683962.URPN. 6683962.URPN.</p> <p>6683962.URPN. (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) (relative with phase with shift\$3) (relative with phase with shift\$3) (relative with phase with shift\$3 with (combin\$3 sum sums summing)) (low adj (frequency pass) bass) ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass)) ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) same (low adj (frequency pass) bass) not ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass))) (relative with phase with shift\$3 with (combin\$3 sum sums summing) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker)) ("2846504" "3088997" "3863028" "3970787" "4088849" "4119798" "4209665" "4218585" "4251688" "4308424" "4589128" "5033086" "5181248" "5371799" "5386082" "5438623" "5459790" "5546465" "5579396" "5598478" "5638343" "5661812" "5742689").PN.)</p> <p>(enhanc\$5 with (low adj frequenc\$3 bass)) (enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) ((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls.)) and harmonics</p>	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:33
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-	2491	(6683962.pn. griesinger.in. (griesinger.in. and (Dave david).in.) ("4356349" "4403112" "4590248" "4623708" "4841572" "5033092" "5172415" "5233665" "5301237" "5339363").PN.) 4356349.URPN. ((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) (downmix\$3 down adj (mix mixes mixing mixer mixes)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) 6683962.URPN. 6683962.URPN. 6683962.URPN. (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) and (downmix\$3 down adj (mix mixes mixing mixer mixes)) not (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and 381/\$.ccls.)) (((dual pair two) with (low adj frequency sub adj woofer subwoofer)with \$4speakers) and (downmix\$3 down adj (mix mixes mixing mixer mixes))) (relative with phase with shift\$3) (relative with phase with shift\$3) (relative with phase with shift\$3 with (combin\$3 sum sums summing)) ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass)) ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) same (low adj (frequency pass) bass) not ((relative with phase with shift\$3 with (combin\$3 sum sums summing)) with (low adj (frequency pass) bass))) (relative with phase with shift\$3 with (combin\$3 sum sums summing) and (sub adj woofer LFE subwoofer low adj frequency adj \$4speaker)) ("2846504" "3088997" "3863028" "3970787" "4088849" "4119798" "4209665" "4218585" "4251688" "4308424" "4589128" "5033086" "5181248" "5371799" "5386082" "5438623" "5459790" "5546465" "5579396" "5598478" "5638343" "5661812" "5742689").PN.) (enhanc\$5 with (low adj frequenc\$3 bass)) (enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) ((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls.)) and harmonics (((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls.) ((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls. and low adj pass)) and harmonics	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:34
-	78	((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls.) ((enhanc\$5 with (low adj frequenc\$3 bass) and (adder summing summation sum sums summer adding combin\$5)) and 381/\$.ccls. and low adj pass)) and harmonics	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/06/30 17:36
-	23	((first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.)) and harmonics	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:15
-	17	((first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.) AND (low adj (frequency) bass))) and harmonics	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/01 10:31

-	4	("4220160" "4594731" "4698842" "4821327").PN.	USPAT	2004/06/30 17:38
-	4	5247380.pn. 5027433.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/01 10:31
-	93	((first adj low adj pass and second adj low adj pass and (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:19
-	22	((first adj low adj pass same second adj low adj pass same (adder summing summation sum sums summer adding combin\$5) and 381/\$.ccls.))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:02
-	7	("4220160" "4594731" "4698842" "4790014" "4790018" "4821327" "5574791").PN.	USPAT	2004/07/02 13:21
-	2	("5654909" "5892833").PN.	USPAT	2004/07/02 13:23
-	4	("3895321" "4495643" "4701717" "4987378").PN.	USPAT	2004/07/02 13:24
-	3948	deriv\$4 with (low with frequency bass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:26
-	166	deriv\$4 with (low with frequency bass) with channel	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:26
-	54	deriv\$4 with (low with frequency bass) with channel same (low adj pass lowpass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:26
-	52	deriv\$4 with (low with frequency bass) with channel with (low adj pass lowpass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:29
-	2	("4053711" "5263086").PN.	USPAT	2004/07/02 13:27
-	30	creat\$4 with (low with frequency bass) with channel with (low adj pass lowpass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:32
-	2	4709014.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:32
-	2	4790014.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:33
-	4	("3213180" "3535969" "4182930" "4698842").PN.	USPAT	2004/07/02 13:32
-	27	pair with low adj pass with left with right	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:47
-	4	("3094587" "3397286" "3944748" "4230905").PN.	USPAT	2004/07/02 13:35
-	26	4408095.URPN.	USPAT	2004/07/02 13:36
-	6	("3668532" "4182930" "4408095" "4841573" "4982435" "4984273").PN.	USPAT	2004/07/02 13:37
-	2	("4024344" "4503554").PN.	USPAT	2004/07/02 13:38
-	4	("3195067" "3222455" "3956709" "4221006").PN.	USPAT	2004/07/02 13:40

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-	62	("3229038" "3757047" "3885101" "4209665" "4308423" "4332979" "4394536" "4495637" "4569074" "4594730" "4703502" "4866776" "5046097" "5208860" "5325435" "5533129" "3665105" "3761631" "3925615" "4218583" "4308424" "4355203" "4408095" "4497064" "4589129" "4622691" "4748669" "4888809" "5105462" "5228085" "5371799" "5661808").PN.	"3697692" "3772479" "4024344" "4219696" "4309570" "4356349" "4479235" "4503554" "4594610" "4648117" "4856064" "4953213" "5146507" "5251260" "5386082"	"3745254" "3849600" "4204092" "4237343" "4329544" "4393270" "4489432" "4567607" "4594729" "4696036" "4866774" "5033092" "5180990" "5255326" "5420929"	USPAT	2004/07/02 13:43
-	626	(low adj pass lowpass) with sum with difference			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:48
-	2118	(low adj pass lowpass) same (sum same difference)			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 13:48
-	451	(low adj pass lowpass) same (sum same difference) same first same second			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 14:01
-	51	((low adj pass lowpass) same (sum same difference) same first same second) and 381/\$.ccls.			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 14:01
-	1	"4118599".PN.			USPAT	2004/07/02 13:54
-	4	4642812.URPN.			USPAT	2004/07/02 13:54
-	1013	(low adj pass lowpass) with sum and (low adj pass lowpass) with difference			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 14:31
-	88	((low adj pass lowpass) with sum and (low adj pass lowpass) with difference) and 381/\$.ccls.			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 14:02
-	76	((low adj pass lowpass) and (highpass high adj pass)) with sum and ((low adj pass lowpass) and (highpass high adj pass)) with difference			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 14:33
-	61	((low adj pass lowpass) with (highpass high adj pass)) with sum and ((low adj pass lowpass) with (highpass high adj pass)) with difference			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:00
-	61	((((low adj pass lowpass) with (highpass high adj pass)) with sum and ((low adj pass lowpass) with (highpass high adj pass)) with difference) and (low adj pass lowpass)			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:00
-	13	((((low adj pass lowpass) with (highpass high adj pass)) with sum and ((low adj pass lowpass) with (highpass high adj pass)) with difference) and (381/\$.ccls.)			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:01
-	3760	(low adj pass lowpass) with filter with network			USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:01

-	229	((low adj pass lowpass) with filter with network) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:02
-	212	(adder summing summation sum sums summer adding combin\$5) and (((low adj pass lowpass) with filter with network) and 381/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:03
-	46	(adder summing summation sum sums summer adding combin\$5) with ((low adj pass lowpass) with filter with network) and (((low adj pass lowpass) with filter with network) and 381/\$.ccls.)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:03
-	29	(adder summing summation sum sums summer adding combin\$5) with ((low adj pass lowpass) with filter with network) and (((low adj pass lowpass) with filter with network) and 381/\$.ccls.) not FM	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:15
-	14	("3541266" "4239939" "4394535" "4479235" "4489432" "4496979" "4555795" "4594610" "4594730" "4625326" "4633495" "4685134" "4706287" "4748669").PN.	USPAT	2004/07/02 15:10
-	1	"4748669".PN.	USPAT	2004/07/02 15:15
-	70	("3170991" "3229038" "3238304" "3246081" "3725586" "3772479" "3860951" "3883692" "3911220" "3916104" "3925615" "3943293" "3944748" "3989897" "4024344" "4027101" "4030342" "4063034" "4069394" "4085291" "4087629" "4087631" "4097689" "4118599" "4135158" "4139728" "4149031" "4149036" "4152542" "4162457" "4185239" "4188504" "4192969" "4204092" "4208546" "4209665" "4214267" "4218585" "4219696" "4239937" "4239939" "4251688" "4268915" "4303800" "4308423" "4308426" "4309570" "4316058" "4329544" "4334740" "4349698" "4352953" "4355203" "4356349" "4388494" "4393270" "4394536" "4394537" "4446488" "4489432" "4495637" "4503554" "4546389" "4549228" "4551770" "4553176" "4562487" "4567607" "4599611" "4683496").PN.	USPAT USPAT	2004/07/02 15:15 2004/07/02 15:15
-	25	((("3170991" "3229038" "3238304" "3246081" "3725586" "3772479" "3860951" "3883692" "3911220" "3916104" "3925615" "3943293" "3944748" "3989897" "4024344" "4027101" "4030342" "4063034" "4069394" "4085291" "4087629" "4087631" "4097689" "4118599" "4135158" "4139728" "4149031" "4149036" "4152542" "4162457" "4185239" "4188504" "4192969" "4204092" "4208546" "4209665" "4214267" "4218585" "4219696" "4239937" "4239939" "4251688" "4268915" "4303800" "4308423" "4308426" "4309570" "4316058" "4329544" "4334740" "4349698" "4352953" "4355203" "4356349" "4388494" "4393270" "4394536" "4394537" "4446488" "4489432" "4495637" "4503554" "4546389" "4549228" "4551770" "4553176" "4562487" "4567607" "4599611" "4683496").PN.) and sum and difference	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:15

-	10	((("3170991" "3229038" "3238304" "3246081" "3725586" "3772479" "3860951" "3883692" "3911220" "3916104" "3925615" "3943293" "3944748" "3989897" "4024344" "4027101" "4030342" "4063034" "4069394" "4085291" "4087629" "4087631" "4097689" "4118599" "4135158" "4139728" "4149031" "4149036" "4152542" "4162457" "4185239" "4188504" "4192969" "4204092" "4208546" "4209665" "4214267" "4218585" "4219696" "4239937" "4239939" "4251688" "4268915" "4303800" "4308423" "4308426" "4309570" "4316058" "4329544" "4334740" "4349698" "4352953" "4355203" "4356349" "4388494" "4393270" "4394536" "4394537" "4446488" "4489432" "4495637" "4503554" "4546389" "4549228" "4551770" "4553176" "4562487" "4567607" "4599611" "4683496").PN.) and sum and difference and (low adj pass lowpass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:15
-	19	((("3170991" "3229038" "3238304" "3246081" "3725586" "3772479" "3860951" "3883692" "3911220" "3916104" "3925615" "3943293" "3944748" "3989897" "4024344" "4027101" "4030342" "4063034" "4069394" "4085291" "4087629" "4087631" "4097689" "4118599" "4135158" "4139728" "4149031" "4149036" "4152542" "4162457" "4185239" "4188504" "4192969" "4204092" "4208546" "4209665" "4214267" "4218585" "4219696" "4239937" "4239939" "4251688" "4268915" "4303800" "4308423" "4308426" "4309570" "4316058" "4329544" "4334740" "4349698" "4352953" "4355203" "4356349" "4388494" "4393270" "4394536" "4394537" "4446488" "4489432" "4495637" "4503554" "4546389" "4549228" "4551770" "4553176" "4562487" "4567607" "4599611" "4683496").PN.) and sum and difference and (low)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:22
-	6193	sum same difference same (low)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:22
-	1681	sum same difference same (low) and (left same right)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:23
-	210	sum same difference same (low) and (left same right) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:23
-	625	sum same difference same (low) and (left same right) and (audio sound music)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:23
-	30	sum same difference same (low) and (left same right) and (woofer sub adj woofer subwoofer)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/02 15:24

-	30	("D351388" "D351839" "0538263" "0709984" "1786279" "2580916" "2643727" "2869667" "2993557" "3477540" "3816672" "3848092" "4107479" "4134324" "4182931" "4196790" "4218583" "4348549" "4580654" "4594729" "4620317" "4630298" "4638505" "4691362" "4759066" "4819269" "4924963" "5333200" "5412732" "5475764").PN.	USPAT	2004/07/02 15:36
-	4	("D351388" "D351839" "0538263" "0709984" "1786279" "2580916" "2643727" "2869667" "2993557" "3477540" "3816672" "3848092" "4107479" "4134324" "4182931" "4196790" "4218583" "4348549" "4580654" "4594729" "4620317" "4630298" "4638505" "4691362" "4759066" "4819269" "4924963" "5333200" "5412732" "5475764").PN. and sum and difference	USPAT	2004/07/02 16:16
-	12	("4908858" "4933786" "5210796" "5216718" "5333201" "5412731" "5524053" "5572591" "5592558" "5638452" "5657391" "5680464").PN.	USPAT	2004/07/02 15:39
-	2	("4680796" "5216718").PN.	USPAT	2004/07/02 15:41
-	8	5333201.URPN.	USPAT	2004/07/02 15:43
-	1656	L-R R-L	USPAT	2004/07/02 16:17
-	1305	(L-R R-L) and (low lowpass)	USPAT	2004/07/02 16:17
-	478	(L-R R-L) and (low lowpass) and 381/\$.ccls.	USPAT	2004/07/02 16:17
-	38	(L-R R-L) and (low lowpass) and 381/\$.ccls. and (subwoofer woofer)	USPAT	2004/07/02 16:18
-	326679	pole	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 10:59
-	39181	pole and filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:00
-	843	(pole and filter) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:00
-	14866	pole same filter	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:00
-	481	(pole same filter) and 381/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:00
-	417	"16" and 381/\$.ccls. and ("16" sixteen)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:00
-	417	(pole same filter) and 381/\$.ccls. and ("16" sixteen)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:01
-	24	(pole same filter) and 381/\$.ccls. and (sixteen)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:01

-	253	(pole same filter) and 381/\$.ccls. and (factor)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:01
-	17	((pole same filter) and 381/\$.ccls. and (sixteen)) and ((pole same filter) and 381/\$.ccls. and (factor))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:02
-	280	allpass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:02
-	2096032	allpass pass	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:02
-	17	((pole same filter) and 381/\$.ccls. and (sixteen)) and ((pole same filter) and 381/\$.ccls. and (factor))) and (allpass pass)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/07/06 11:02

different downmixing circuits. One example is described in U.S. patent application Ser. No. _____. Combining circuitry 23 and 28 may have a plurality of cascaded stages for combining the signals input at the input terminals.

[0023] Referring to FIG. 2b, there is shown another embodiment of the invention, for combining three or more signals, which may represent three or more channels. The signals are input at input terminals 12-1 . . . 12-n. Phase shifting circuitry 18 shifts the phase of each signal, so that the relative phase of the signal input at an input terminal is shifted relative to that of the other signals. The relative phase shifts can be nonuniform or uniform according to a pattern, for example, by shifting each channel by $i360/n$ degrees (where $i=0$ to $n-1$, or $i=1$ to n). Care should be taken so that if a relative shift of greater than 120 degrees and less than 240 degrees occurs between two channels, it should occur only between channels that are unlikely to have correlated and in-phase content. Typically, diagonal channel pairs (left surround/right front, and right surround/left front) are unlikely to have correlated and in-phase content. One way of implementing the phase shifting circuitry of FIG. 2b is to apply individual phase shifting elements 19-1 . . . 19-n, such as all-pass filters as will be discussed below.

[0024] Referring now to FIGS. 3a-3d, there are shown four block diagrams of four audio signal processing circuits implementing the combining circuit of FIG. 1 and showing an additional feature of the invention. In the implementations of FIGS. 3a and 3c, combining circuit 10 has additionally one or more low-pass filters 42 and may have equalizers 40 coupling the output terminals 20', 44, 46, 52, 54 with the other portions of the circuitry. Two low-pass filters 42 may be placed so that they couple input terminals 12 and 14 with phase shifting circuitry 18, respectively (as shown in FIGS. 3a and 3b), or one low pass filter may be placed so that it couples output of summer 16 with output terminal 20 (as shown in FIGS. 3c and 3d). Low-pass filters 42 operate so that the audio signals at output terminal 20 contain only spectral components in the bass frequency range. The placement and purpose of the equalizer 40 will be discussed below. In the implementations of FIGS. 3a and 3d, the combining circuit 10 is implemented in an audio system having two high frequency channel output terminals 44 and 46 and a bass output terminal 20'. The high frequency output terminals 44 and 46 are coupled to input terminals 12 and 14 by high pass filters 48 and 50. The implementations of FIGS. 3a and 3d are typical of a satellite system, in which the low frequency sounds from all channels are radiated from a nonlocalizable module, and in which the high frequency sounds are radiated from a plurality of upper frequency radiators.

[0025] In the implementations of FIGS. 3b and 3c, the combining circuit 10 is implemented in an audio system having two output terminals 52 and 54 to which full range speakers are coupled. In FIGS. 3b and 3c, the inputs of summers 56 and 58 are coupled to input terminals 12 and 14 by high-pass filters 48 and 50, respectively. The inputs of summers 56 and 58 are also coupled to output terminal 20, and the output of summers 56 and 58 are coupled to full range output terminals 52 and 54. The result is that audio signals at terminals 52 and 54 include the bass spectral components, phase shifted and combined, and the high frequency portions of the channels input at input terminals

12 and 14. The implementations of FIGS. 3b and 3c are typical of audio systems employing a plurality of full range speakers.

[0026] To improve frequency response, equalizers 40 may be employed to adjust the frequency response. In the implementations of FIGS. 3a and 3d, there may be equalizers 40 coupling input terminals 12 and 14 with output terminals 44 and 46 respectively, and an equalizer 40 coupling summer 16 and bass output terminal 20'. In the implementations of FIGS. 3b and 3c, there may be equalizers 40 coupling input terminals 12 and 14 with summers 56 and 58 respectively, and an equalizer 40 coupling summer 16 and combining circuit output terminal 20. Alternatively, in the implementations of FIGS. 3b and 3c, the three equalizers may be replaced by two equalizers coupling summers 56 and 58 with output terminals 52 and 54, respectively.

[0027] In the systems of FIGS. 3a-3d, the signal summing or combining at summers 16 may be additive or differential. Additive and differential summation may give different results, especially if the signals contain "surround" information encoded using some popular techniques. Generally, differential summation works well in all circumstances, while additive summation may work less well.

[0028] Referring now to FIGS. 4a and 4b, there is shown a schematic diagram of the signal processing portion of a test circuit for illustrating some of the features of the invention. The circuit of FIGS. 4a and 4b implements a system having the topology of FIG. 3c, with a single equalizer 40 coupling summer 16 and low pass filter 42. In FIGS. 4a and 4b, the reference numerals refer to portions of the circuit which implement the blocks of FIG. 3c.

[0029] Referring now to FIG. 5a, there is shown a plot of phase shift versus frequency for the circuit of FIGS. 4a and 4b. Curve 76 represents the amount by which the audio signal input at input terminal 12 is shifted by phase shifting circuitry 18. Curve 78 represents the amount by which the audio signal input at input terminal 14 is shifted by phase shifting circuitry 18. Curve 80 represents the phase shift difference between curves 76 and 78, or in other words the relative phase shift imparted by the circuit of FIGS. 4a and 4b.

[0030] In a two-channel system, or in a system in which channels have been downmixed as in the embodiment of FIG. 2a, the phase shift difference is preferably 60 to 120 degrees over the frequency range of interest. A phase shift difference of 120 degrees or greater may cause attenuation if the channels were initially in phase. A phase shift difference of 60 degrees or less may not alleviate the signal cancellation problem if the channels were initially out of phase. Generally it is desirable to have signals in the frequency range of interest to be relatively phase shifted by between 60 and 120 degrees, and to have most in the frequency range relatively shifted by close to 90 degrees.

[0031] The plot of FIG. 5a illustrates the principle that some implementations of the invention, such as the circuit of FIGS. 4a and 4b which employ single stage all-pass filters, do not create the same phase shift difference over the entire frequency band of interest. According to this plot, the circuit of FIGS. 4a and 4b creates a phase shift difference of between 60 and 120 degrees in the frequency range of about 20 Hz to about 500 Hz, with a maximum phase shift of about

110 degrees at about 90 Hz, and causes a phase shift difference of different amounts, down to nearly zero degrees at other frequencies. This property of a circuit shifting the frequency by zero degrees at some frequencies can be used to advantage in some situations, such as the embodiment of FIG. 8a 1 below.

[0032] A 90-degree phase shift has an especially desirable property, namely producing a similar boost in the output, regardless of the phase and correlation relationship of the input signals. Generally, the most common phase and correlation relationships between two channels are correlated and in phase, correlated and in phase opposition (that is, out of phase by 180 degrees), and uncorrelated (in which case phase is irrelevant). If two equal amplitude correlated and in-phase channels are combined, the combined output is boosted by 6 dB. If two equal amplitude correlated and 180 degrees out-of-phase signals are combined, they cancel. If two equal amplitude signals are uncorrelated, the combined output is boosted by 3 dB.

[0033] With regard to the invention, if the phase shift difference applied by the circuitry is 90 degrees, the resultant combined signal consists of two components with a phase difference of 90 degrees, regardless of whether the two input signals were in phase or out of phase before being combined. When two signals with a phase difference of 90 degrees (regardless of whether they are correlated or uncorrelated) are combined, the boost is about 3 dB. The boost of the circuit is therefore a uniform 3 dB, regardless of whether the two input signals were in phase or out of phase before combining.

[0034] FIG. 5b shows that the circuit of FIGS. 4a and 4b exhibits a substantially consistent 0 dB magnitude response over the frequency range shown.

[0035] Referring now to FIG. 6, there is shown a block diagram of an audio signal processing circuit implementing the topology of FIG. 3d, and further including combining circuits for downmixing channels, as shown in FIG. 2a. The audio system has six input channels (left surround (Ls), right surround (Rs), low frequency effects (LFE), and center (C). First downmixing combiner 23 has as inputs the Rs channel signal, the L channel signal, and a signal that is the sum of the scaled inputs of the C channel signal and the LFE channel signal. Second downmixing combiner 28 has as inputs the Ls channel signal, the R channel signal, and a signal that is the sum of the scaled inputs of the C channel signal and the LFE channel signal. Phase shifting circuitry 18 includes two cascaded digital all-pass filters 18-1 and 18-2 applied to the signal at input 12 and two cascaded digital all-pass filters 18-3 and 18-4 applied to the signal at input 14. Each of the six input channels has an output channel output terminal, 52-1 through 52-6.

[0036] The implementation of FIG. 6 is particularly suited to a digital signal processing 5.1 channel system for decoding matrix encoded signals. With matrix encoded signals, the surround channel signal is shifted in phase with respect to the left and right channel signals by -90 degrees. This signal is then added with the left channel signal and subtracted with the right channel signal such that it appears in the left and right channel signal shifted in phase by a relative 180 degrees. Because of the phase relationships of the channels in a matrix encoded system, the decoded, quadrature shifted, multi-channel signals are differentially combined at summer 16.

[0037] Referring now to FIG. 7a, there is shown a plot of phase shift vs. frequency for the embodiment of FIG. 6, with filter 18-1 having a pole at -8.376 Hz. and a zero at 8.376 Hz, filter 18-2 having a pole at -134 Hz and a zero at 134 Hz, filter 18-3 having a pole at -37.44 Hz and a zero at 37.44 Hz, and filter 18-4 having a pole at -599.17 Hz and a zero at 599.17 Hz. In the implementation of FIG. 6, which has multi-stage all-pass filters, the desirable phase shift of -90 degrees is closely realized over a wide range of frequencies. The frequency spacing in each path (filters 18-1 and 18-2, 8.376 Hz to 134 Hz, filters 18-3 and 18-4, 37.44 Hz to 599.17 Hz) are each a factor of about 16. Generally, an in-path spacing of 16 gives the highest degree of accuracy of in-path phase shift, while an in-path spacing of greater than 16 applies the in-path phase shift over a wider frequency range. The left to right side spacing (8.376 Hz to 37.44 Hz and 134 Hz to 599.17 Hz) are each a factor of 4.5. Generally, a left to right side spacing of 4 gives high accuracy of left to right difference in phase shift, and factors of greater than 4 furnishes the phase shift difference over a wider range of frequencies.

[0038] In addition to single stage or multistage all-pass filters, the phase shift circuitry can also be implemented by circuitry implementing Hilbert transform functions. In commercial implementations, all-pass filters may be preferable due to the simplicity of the circuitry. Single and multi-stage all-pass filters and Hilbert transform functions can be implemented using analog circuits, digital circuits, or microprocessors running digital signal processing software.

[0039] FIG. 7b, shows the magnitude response for the combining portion of the circuit of FIG. 6. The magnitude response is a substantially consistent +3 dB over the frequency range of interest, with a rolloff over the low-pass filtered portion of the frequency range.

[0040] Referring now to FIG. 8a, the properties of all-pass filters can be used to simplify the circuits of FIGS. 3b and 3c, in which the output signals are full range signals. If the phase shifter 18 is implemented as two all-pass filters (18-1 and 18-2), chosen with parameters such that the phase shift operates only on a lower portion of the frequency spectrum, the high frequency paths, the result of FIGS. 3b and 3c, can be established with the circuit of FIG. 8a. With all-pass filter 18-1 having a pole at -378 Hz and a zero at +378 Hz and all-pass filter 18-2 having a pole at -54.7 Hz and a zero at +54.7 Hz, phase shifter 18 shifts the phase by 80 degrees at 63 Hz and by 100 degrees at 315 Hz.

[0041] The audio system of FIG. 8a is preferably used with a pair of full range speakers. The sound waves radiated in response to the audio signals in the two channels are summed acoustically, after transduction, rather than electronically before transduction as in the embodiment of FIG. 6. In a situation in which radiated sound waves are summed acoustically, the power response is a function of loudspeaker spacing, speaker directivity and the wavelength of the radiated sound, but not the phase response of the audio system. So while equalizers 40 may be desirable for other reasons, in a system such as FIG. 8a, the equalizers may be omitted for a spatially averaged target response.

[0042] FIG. 8b shows the frequency response of the circuit of FIG. 8a.

[0043] Referring now to FIG. 9, there is shown another implementation of the invention. In the implementation of